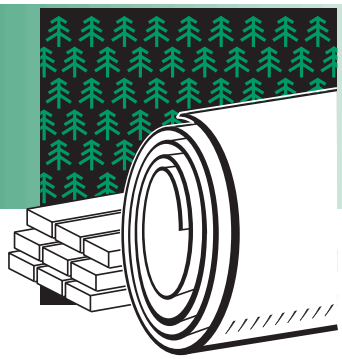
FOREST PRODUCTS

Project Fact Sheet



NON-CONTACT LASER ACOUSTIC SENSOR FOR ON-LINE MEASUREMENT OF PAPER STIFFNESS

BENEFITS

- Improved productivity
- Enhanced and consistent product quality
- Reduced waste and pollution
- Reduced use of feedstock
- Increased energy efficiency

APPLICATIONS

Measurex, a leading developer and manufacturer of on-line sensors for the paper industry, is serving as a partner in this project to ensure the technology will be relevant to industry's needs. Lasson Technology, Inc. and Polytec PI, Inc. are also working with the project to adapt their laser-based surface vibrometry technology to a paper application.

LASER ULTRASONICS TECHNOLOGY WILL HELP IMPROVE PAPER UNIFORMITY ACROSS THE WEB

During paper processing, the mechanical properties of the paper are critical to mill operations and to the quality of the final product. Sensors to measure the stiffness or strength of paper on-line have been undergoing refinements for more than 25 years. Until now, these sensors have operated through direct contact with the paper, but contactless methods are also highly desirable to the industry. Their benefits include eliminating potential damage to the moving web, and being able to monitor specialized paper and paperboards. Information on fiber orientation distributions is also of interest to papermakers for monitoring stresses in paper and basic papermaking processes such as wet pressing.

Using a laser-based detection system that is rugged and simple to operate, industry will be able to obtain measurements over 100 percent of the web width and exercise real-time control of the manufacturing process. By preventing variability of the mechanical properties of the paper, the paper can be manufactured to specifications. The use of pulp feedstock will be optimal because less fiber will be required. There will be significant improvements in productivity and product quality, and fewer processing wastes and environmental pollutants will be generated. Energy use in mills will be reduced as less refining and less remanufacturing are required.

LASER ACOUSTIC SENSOR

A view of the LBNL system for laser-based generation and detection of acoustic waves in moving paper, for non-contact, on-line measurement of paper mechanical properties

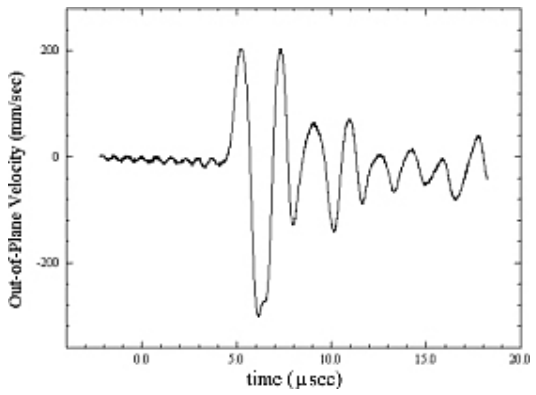
Project Description

Goal: To demonstrate an optical fiber sensor system that measures elastic properties across the entire width of the web to provide feedback control for the paper manufacturing process. The immediate technical goals are to efficiently excite acoustic waves in the paper, optimally measure the scattered light, and interpret the scattered signal to ascertain the elastic properties.

This project will build on previous measurements of the angle-dependence of scattering in more than a dozen types of paper. Information was obtained on the optimum geometry for measurements, and on the fiber orientation and degree of fiber orientation in paper. Together, these measurements provide a better estimate of the paper's strength.

Progress & Milestones

- Integrate a commercial non-contact vibrometer into a bench-scale system for
- acoustic velocity measurements in moving paper.
- Demonstrate measurements using laser-induced ultrasonics on moving paper.
- Compare acoustic stiffness data with transducer-based measurements.
- Investigate the effect of temperature (200°F) on elasticity and the ultrasonic signal's amplitude.
- Demonstrate the sensor on a web moving at production speed.
- Complete a conceptual design for the web-inspection system.



Signal from laser-generated acoustic wave in paper moving at 10 m/sec

Awards, Patents, and Invention Records

The patented LBNL interferometric detector will be used in these experiments.

Project Partners

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Measurex Corporation
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